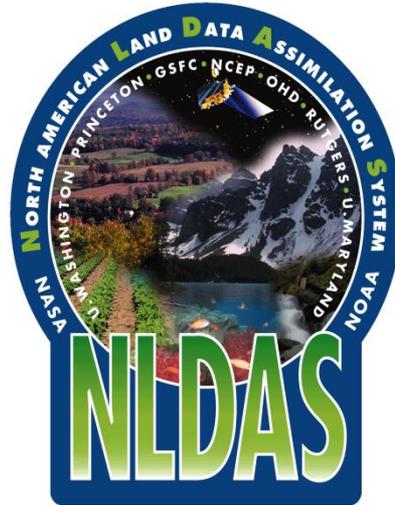


Actual real-time NLDAS-2 test: Design and a preliminary comparison for Noah model



Move toward an actual real-time operational NLDAS system

Youlong Xia, Jesse Meng, Helin Wei, and Michael B. Ek

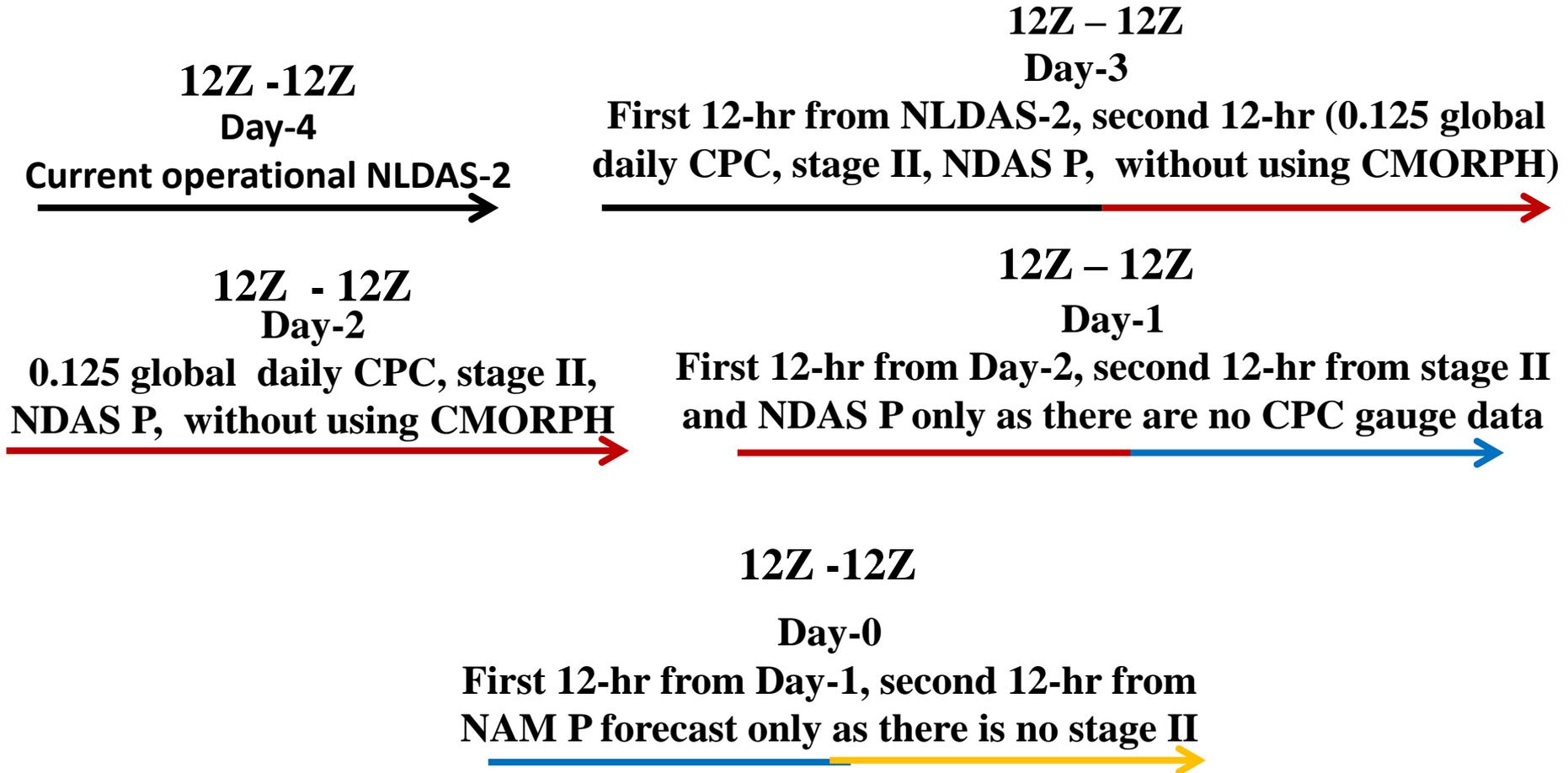
10 June 2016 – Land group meeting

Background

- **Current operational NLDAS-2 has 3.5-day lag (forcing and Mosaic) and 4-day lag (Noah, SAC & VIC). The reason is that NARR has 3-day lag to achieve actual real-time and CPC precipitation (12Z -12Z) to lead 3.5 day lag**
- **A user community survey conducted in 2014 showed that almost all users want to use actual real-time NLDAS system, in particular for US drought monitor author group. As they are producing a weekly map (7-day) and NLDAS is missing 4 days.**
- **Our EMC land team has successful experience for GLDAS (Jesse Meng) and the similar idea can be adapted for operational NLDAS-2 system**
- **NLDAS phase 1 has developed some codes and scripts (Helin Wei) using NDAS and NAM and they can be tested on WCOSS machine for this purpose**

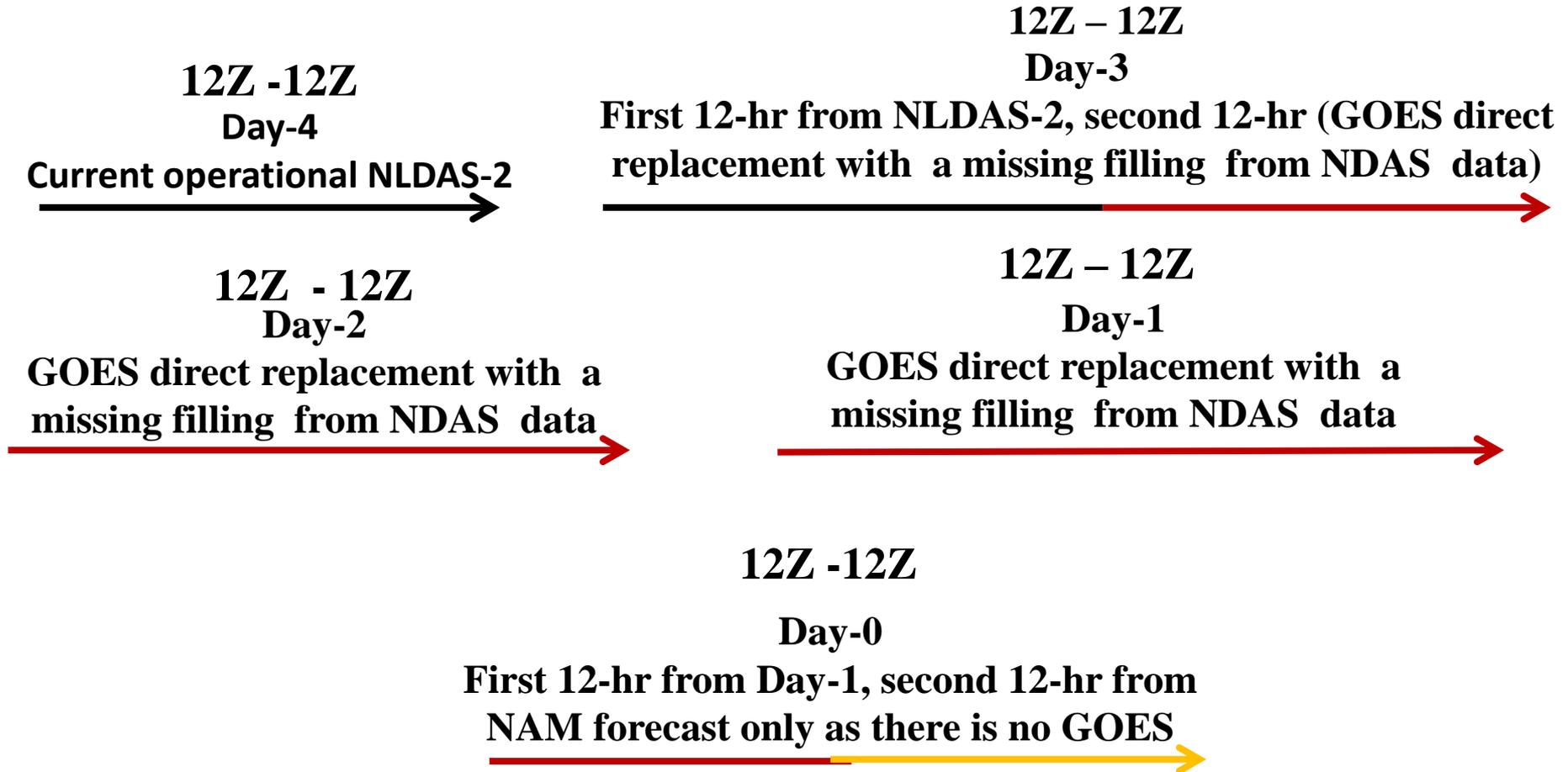
System Design

a. Precipitation



System Design

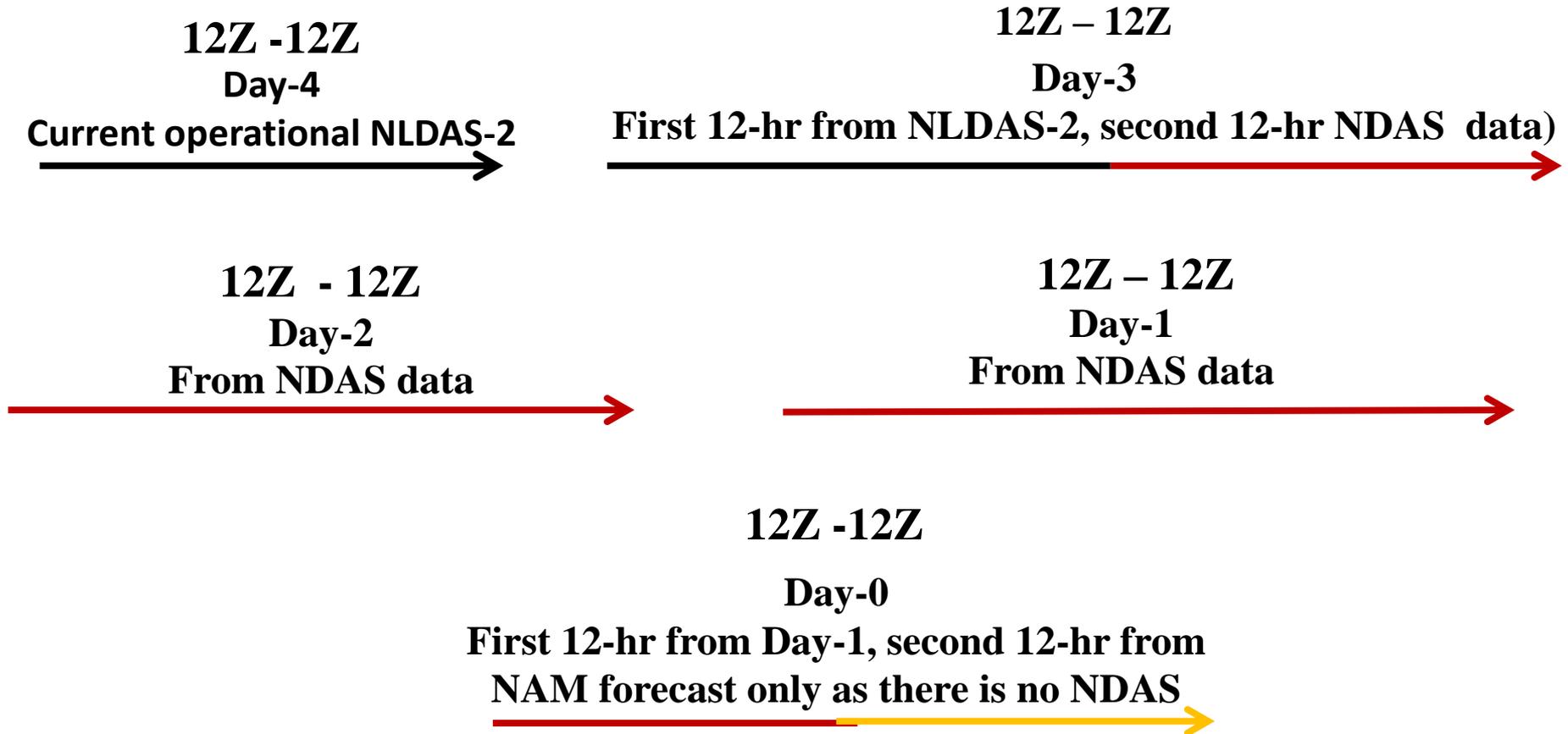
b. Downward shortwave radiation



GOES downward shortwave radiation is obtained from Jesse Meng's WCOSS run directly

System Design

c. The other forcings (e.g, Tair, Press, U, V, Q, DLWR)



Two-Cycle run

Cycle one: Current OPS NLDAS still run 3.5-4 day behind

Cycle two: Catch up actual realtime from 3.5-4 day time point

For Cycle two of each day, the initials for land surface/routing models, we used cycle one run. The same strategy has been used in NCEP CFSR/GLDAS. Therefore, the effect of forcing on NLDAS system product is minimized.

As NCO does not allow replacement, the real-time NLDAS system will save past five-day output. For example today run is 9 June 2016, we will save 5, 6, 7,8, 9 June in 20160609 directory.

Some discontinuities

CONUS

Precipitation: CPC gauge – Stage II – NAM forecast

Downward solar – Bias-corrected NARR – GOES – NAM

Other Forcings: NARR-NDAS-NAM

Southern Canada and Northern Mexico

Precipitation: CPC gauge – NDAS – NAM forecast

Downward solar – Bias-corrected NARR – GOES – NAM

Other Forcings: NARR-NDAS-NAM

**Several Examples:
Simple visual comparison**

Case Analysis: A visual comparison

OPS

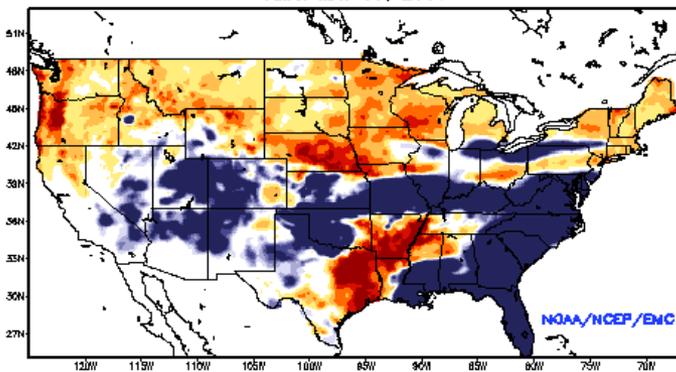
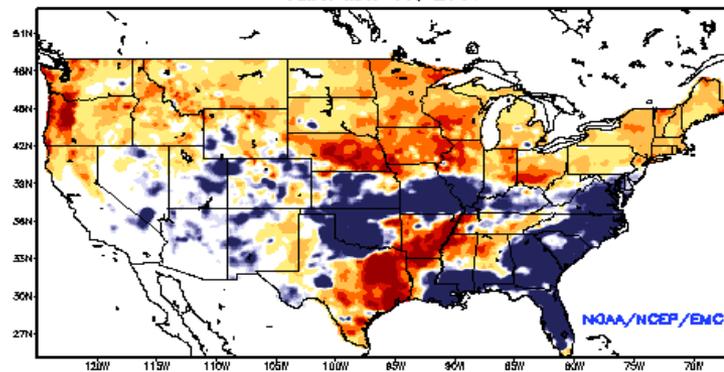
Realtime

**17 May Run
Precipitation**

NLDAS - Current Precipitation Anomaly (mm/day)
Valid: MAY 17, 2018

NLDAS - Current Precipitation Anomaly (mm/day)
Valid: MAY 17, 2018

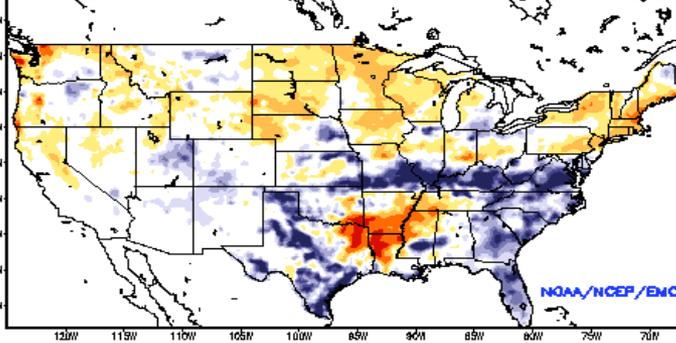
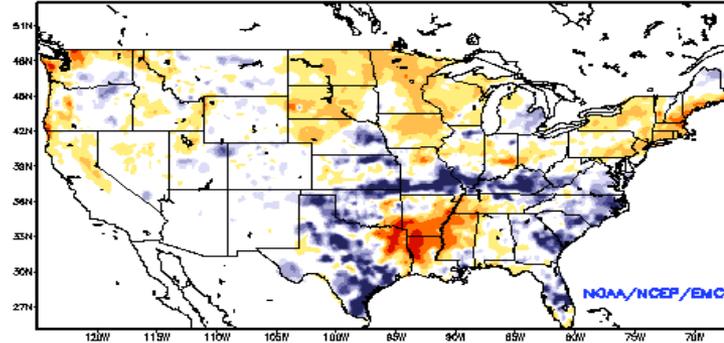
Daily



NLDAS - Past Week Precipitation Anomaly (mm/day)
Valid: MAY 17, 2018

NLDAS - Past Week Precipitation Anomaly (mm/day)
Valid: MAY 17, 2018

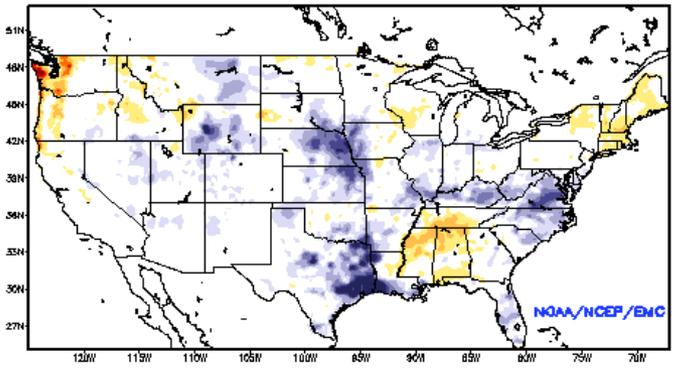
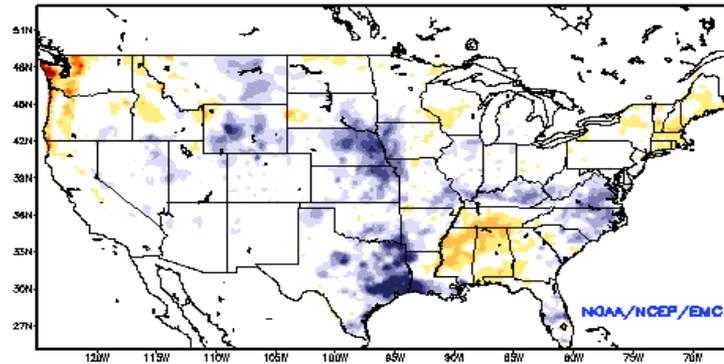
Weekly



NLDAS - Past Month Precipitation Anomaly (mm/day)
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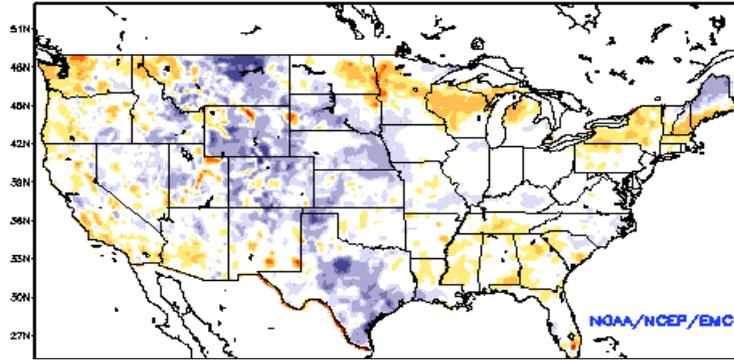
NLDAS - Past Month Precipitation Anomaly (mm/day)
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Monthly

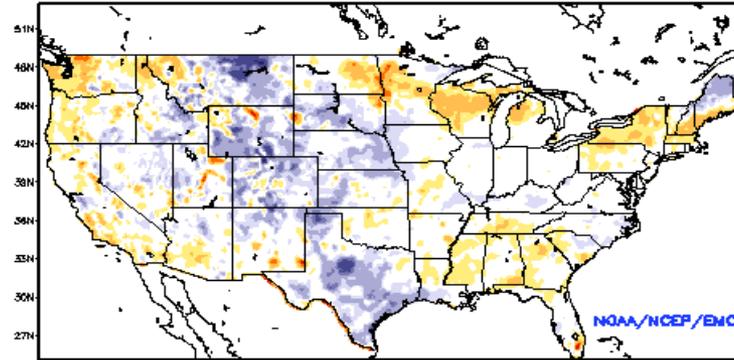


Top 1m Soil Moisture Anomaly
OPS

NCEP Noah - Current Top 1M Soil Moisture Anomaly (mm)
Valid: MAY 17, 2016

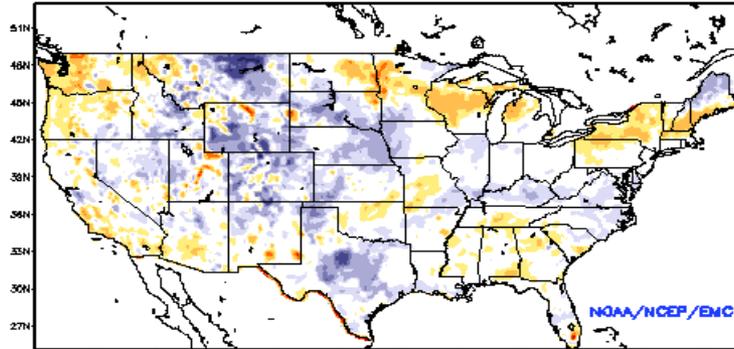


NCEP Noah - Current Top 1M Soil Moisture Anomaly (mm)
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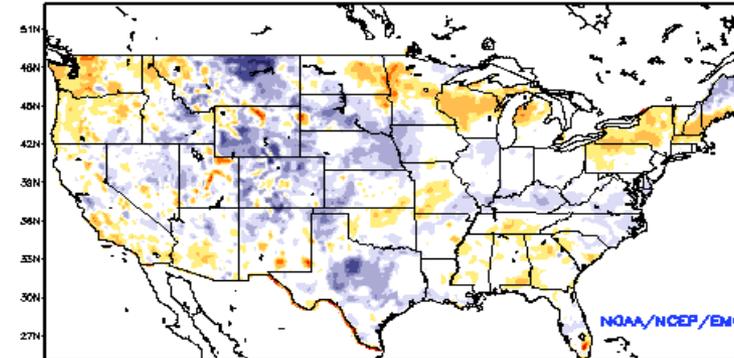


Realtime

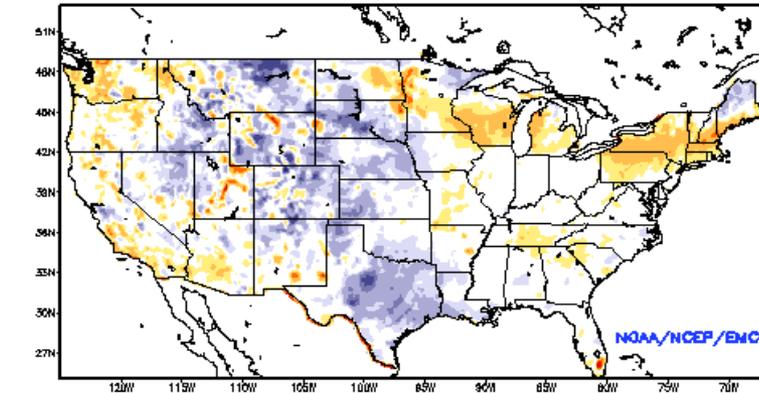
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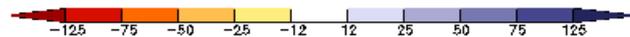
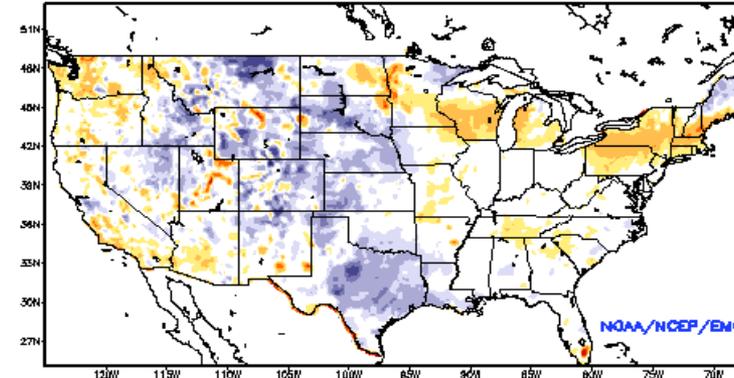
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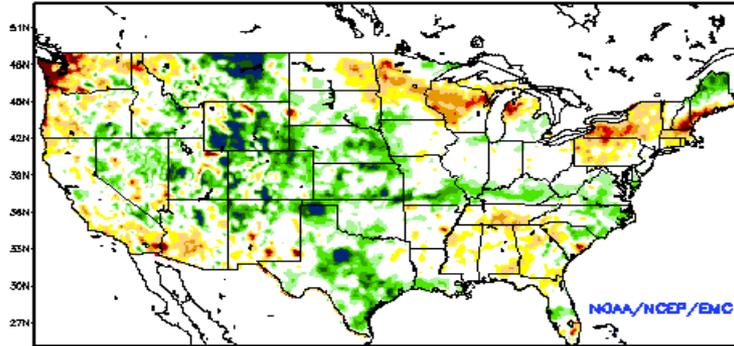


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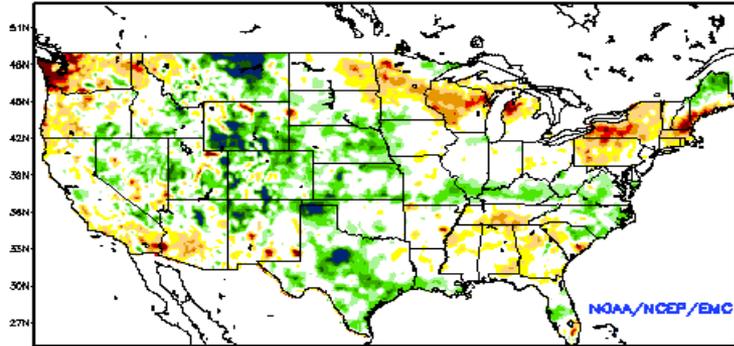


OPS
Top 1m Soil Moisture Percentiles

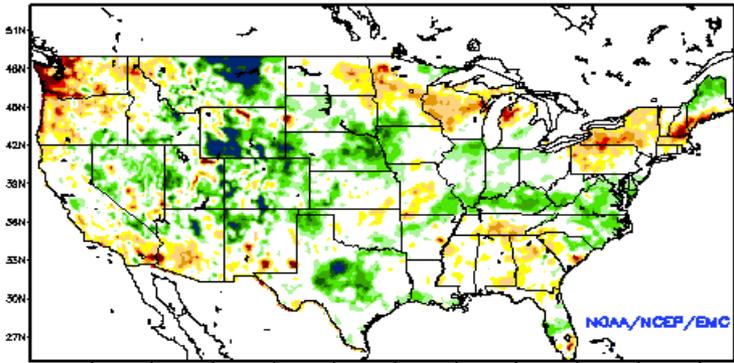
NCEP Noah - Current Top 1M Soil Moisture Percentile
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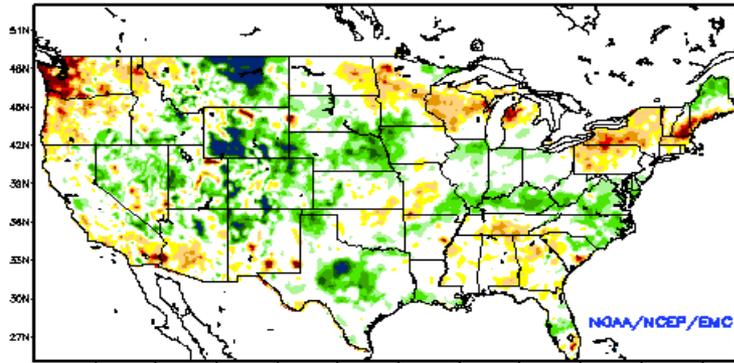
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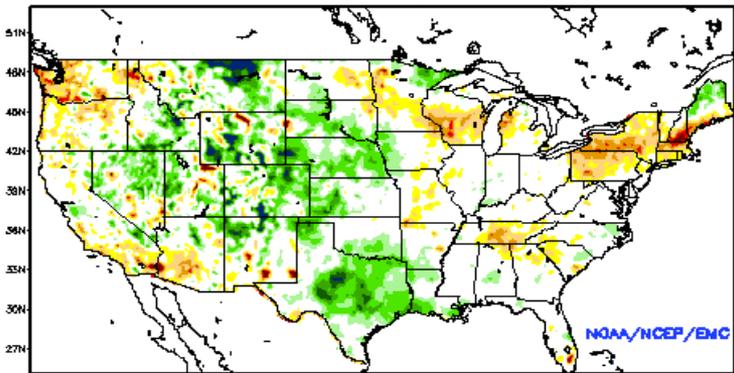
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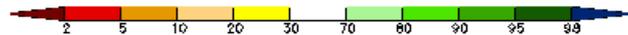
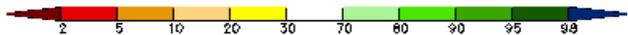
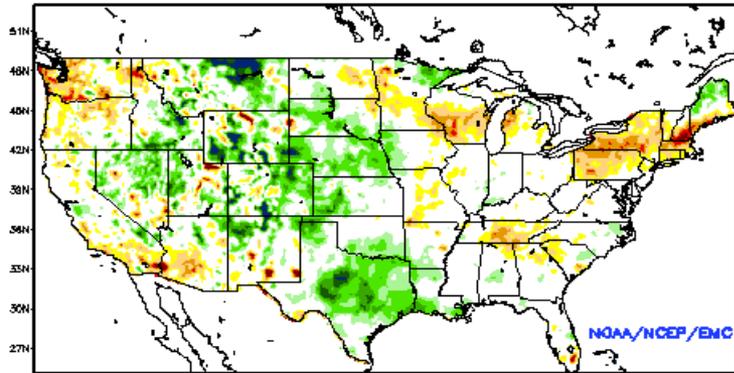
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NCEP Noah - Past Month Top 1M Soil Moisture Percentile
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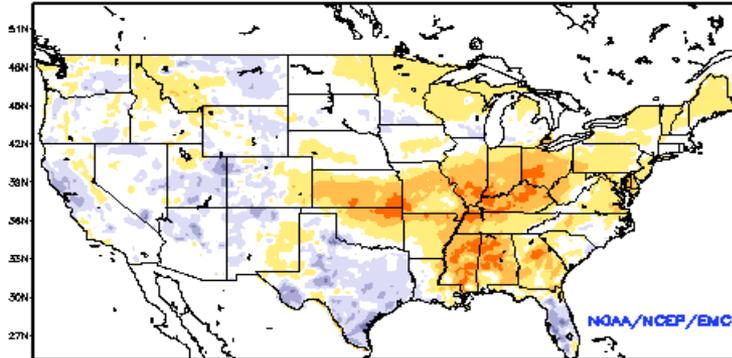
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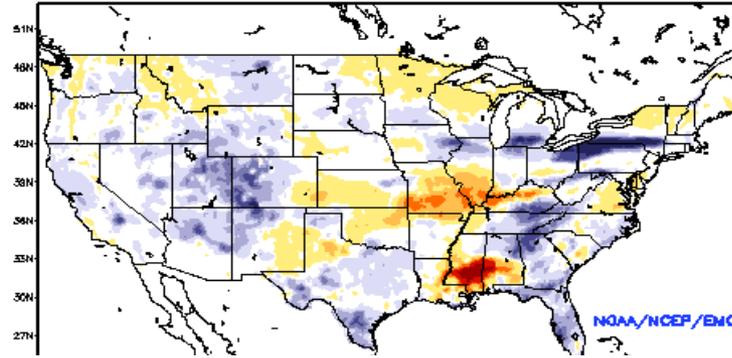
Realtime

ET Anomaly

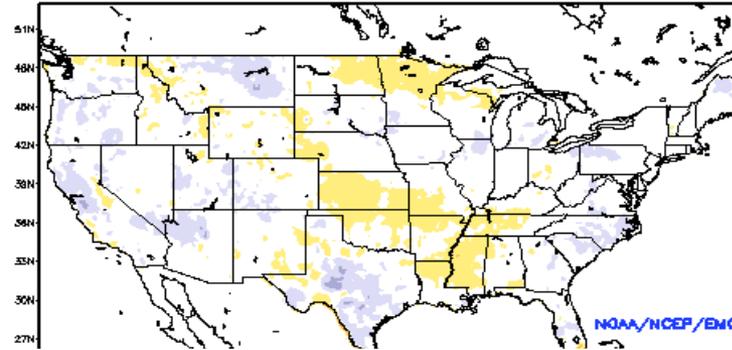
NCEP Noah - Current Evaporation Anomaly (mm/day)
Valid: MAY 17, 2016



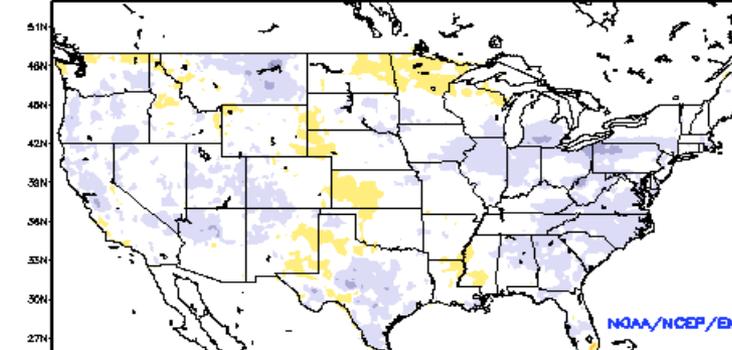
NCEP Noah - Current Evaporation Anomaly (mm/day)
Valid: MAY 17, 2018



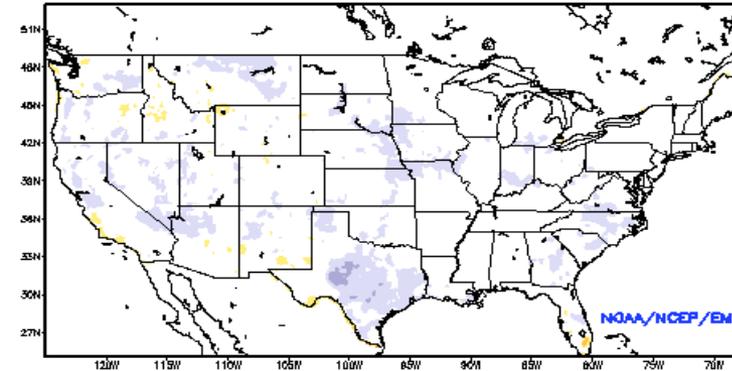
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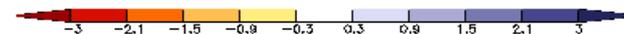
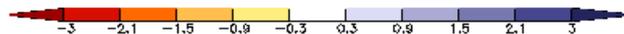
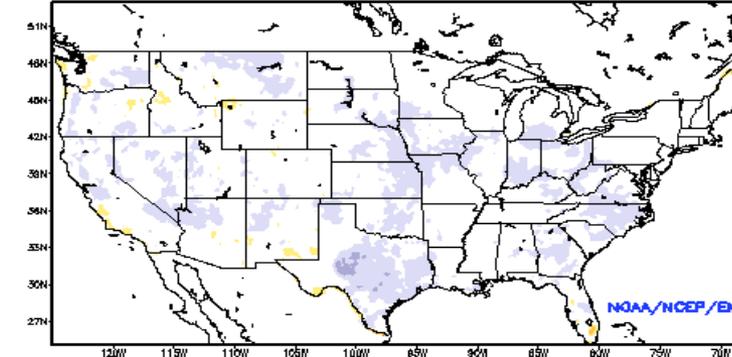
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NCEP Noah - Past Month Evaporation Anomaly (mm)
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NCEP Noah - Past Month Evaporation Anomaly (mm)
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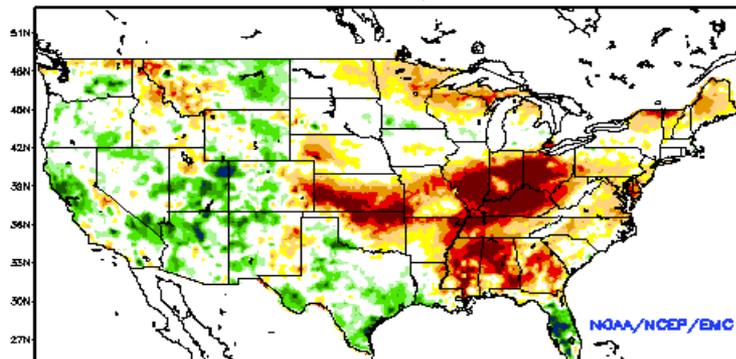


Realtime

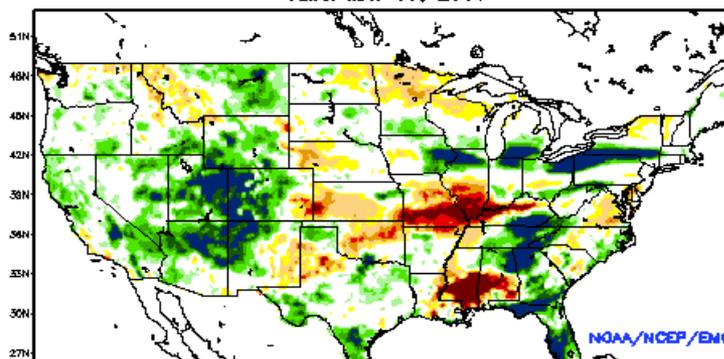
OPS

ET Percentile

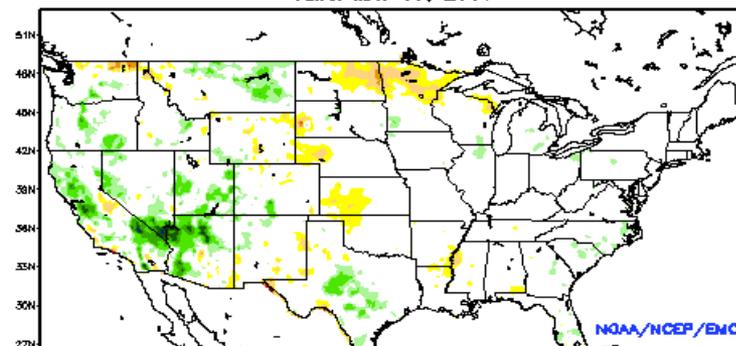
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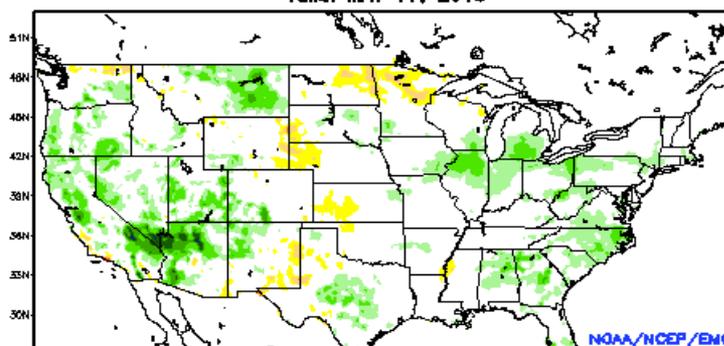
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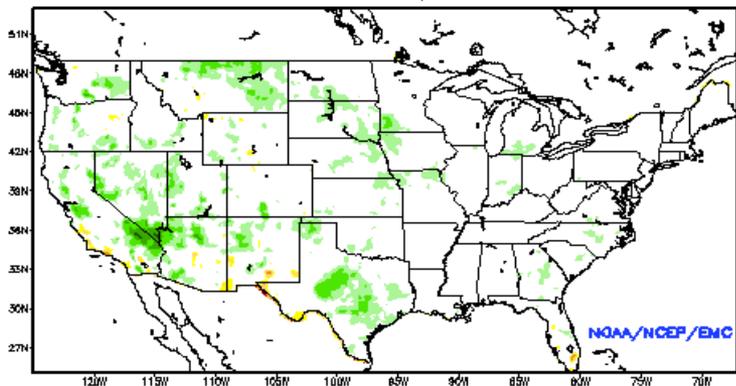
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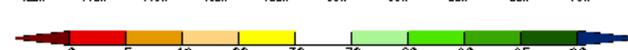
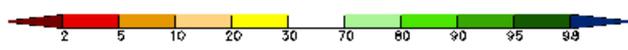
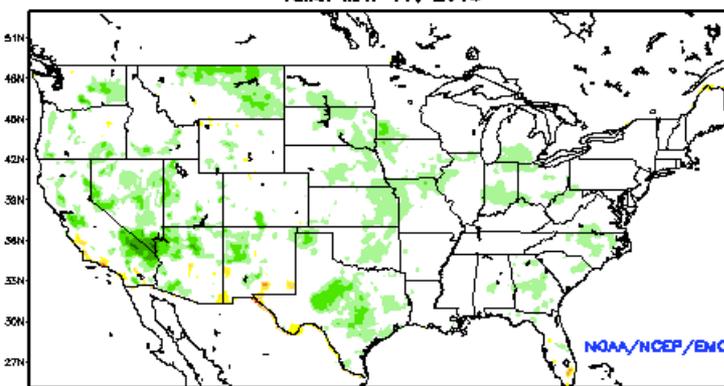
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NCEP Noah - Past Month Evaporation Percentile
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NCEP Noah - Past Month Evaporation Percentile
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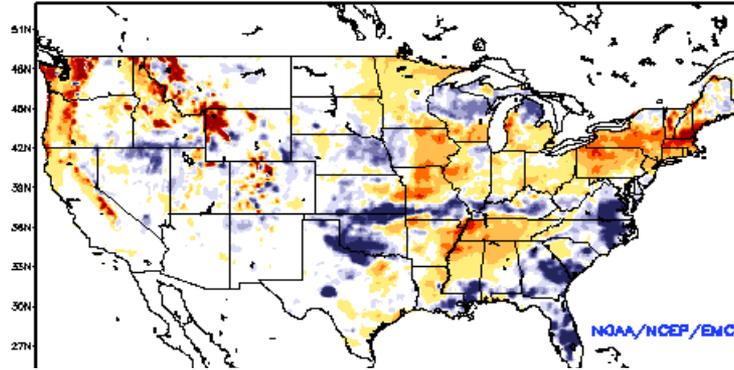


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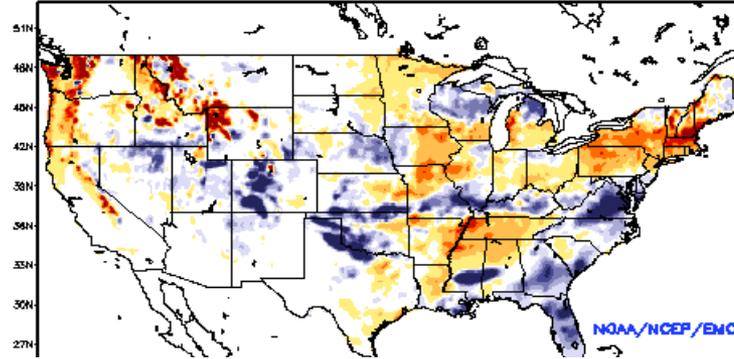
Realtime

Q Anomaly

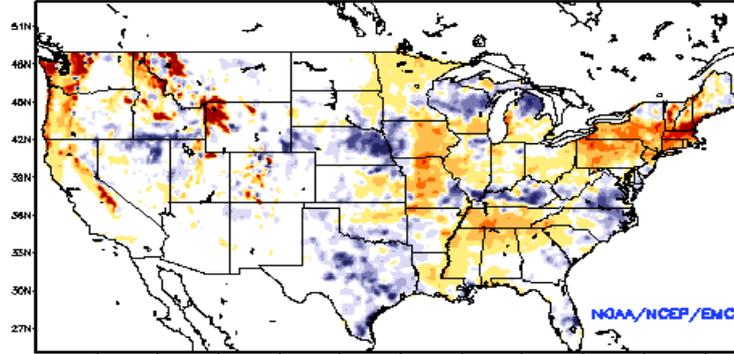
NCEP Noah - Current Total Runoff Anomaly (mm/day)
Valid: MAY 17, 2016



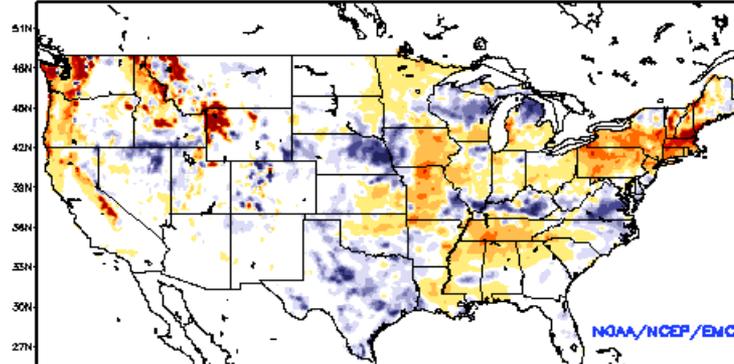
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Valid: MAY 17, 2016



NCEP Noah - Past Week Total Runoff Anomaly (mm/day)
Valid: MAY 17, 2016

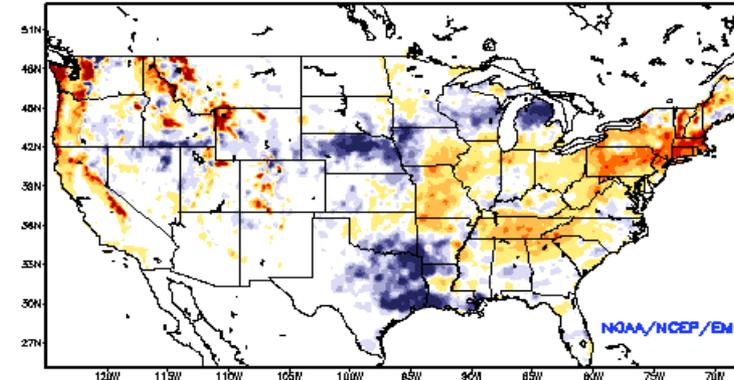


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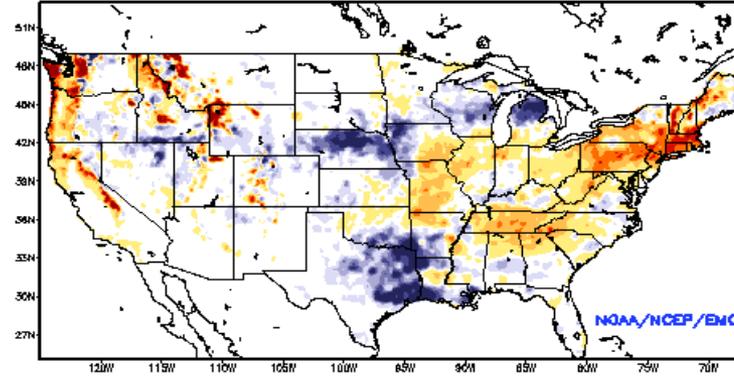


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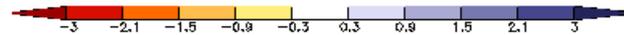
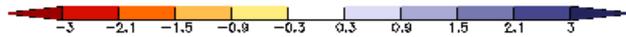
NCEP Noah - Past Month Total Runoff Anomaly (mm)
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NCEP Noah - Past Month Total Runoff Anomaly (mm)
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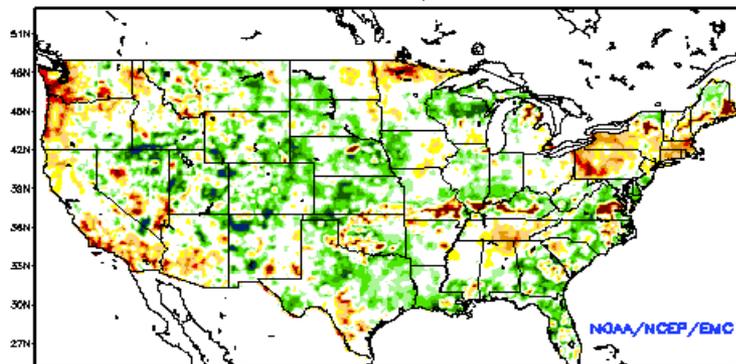


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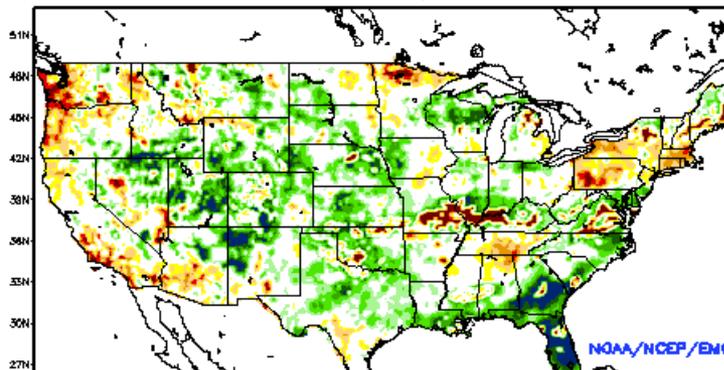


Q Percentile

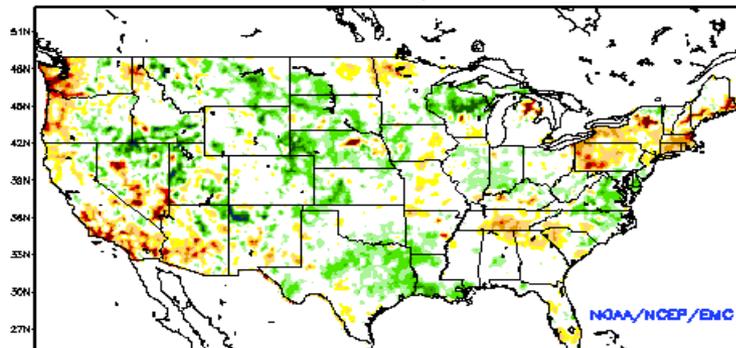
NCEP Noah - Current Total Runoff Percentile
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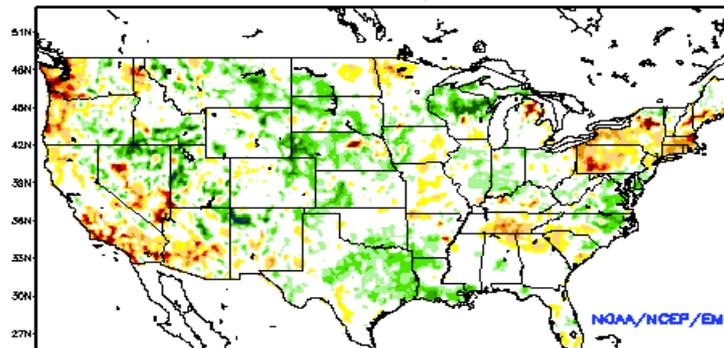
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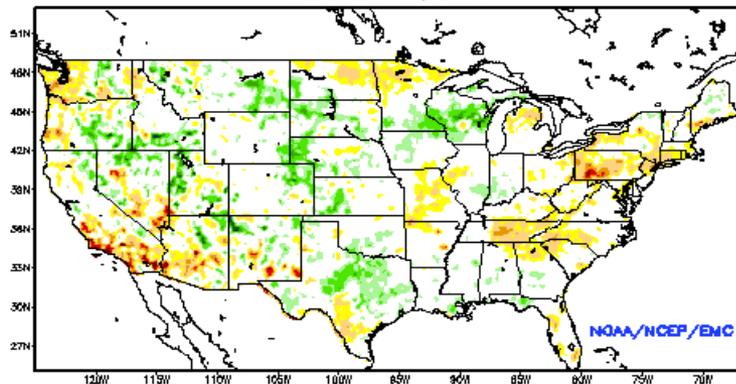


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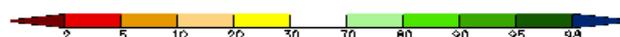
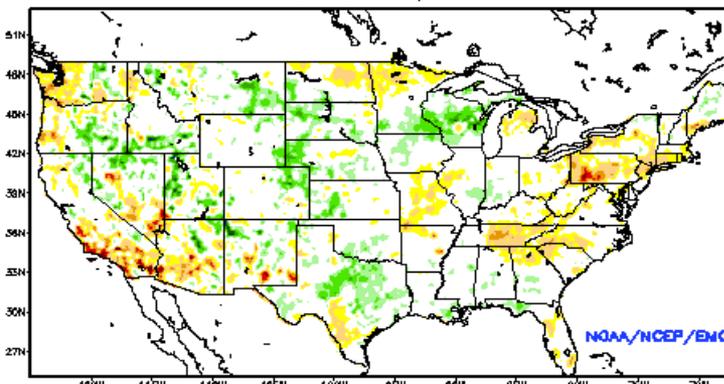


Realtime

NCEP Noah - Past Month Total Runoff Percentile
Valid: MAY 17, 2016



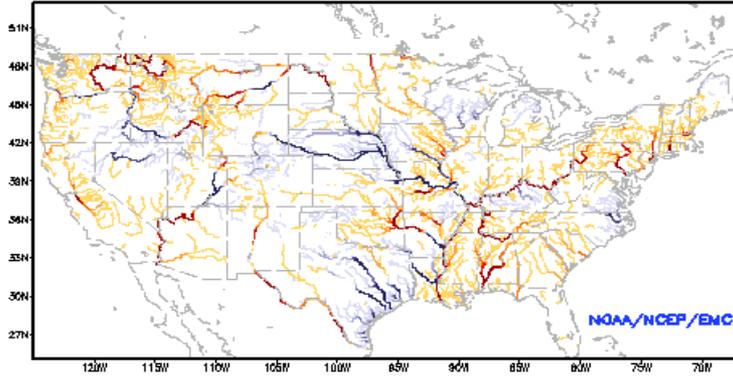
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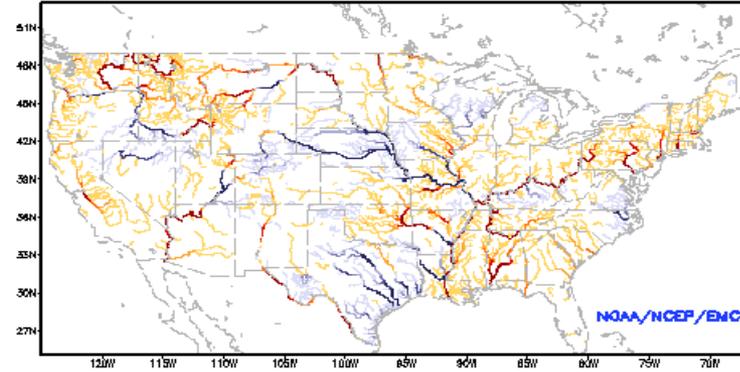
OPS

OPS Streamflow Anomaly

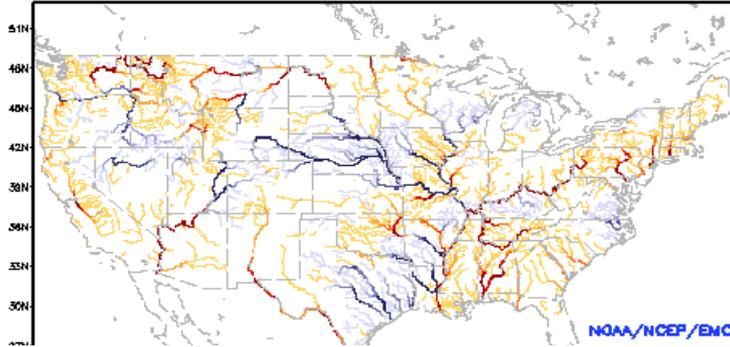
NCEP Noah - Current Streamflow Anomaly (m³/s)
Valid: MAY 17, 2016



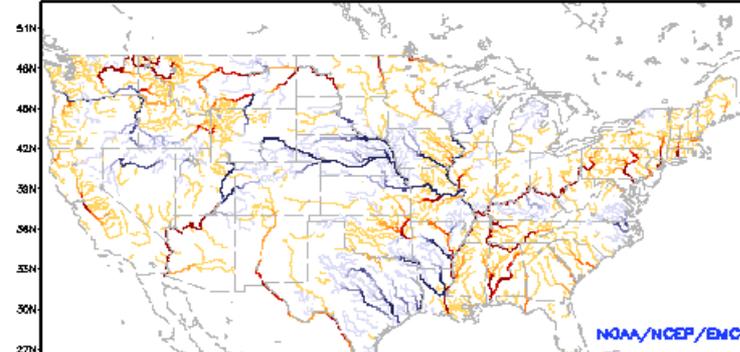
NCEP Noah - Current Streamflow Anomaly (m³/s)
Valid: MAY 17, 2016



NCEP Noah - Past Streamflow (m³/s)
Valid: MAY 17, 2016

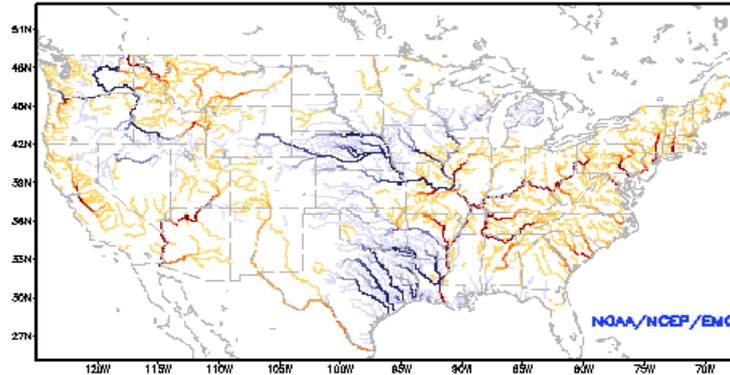


NCEP Noah - Past Streamflow (m³/s)
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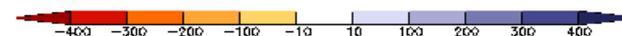
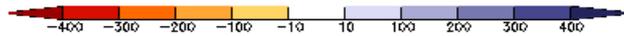
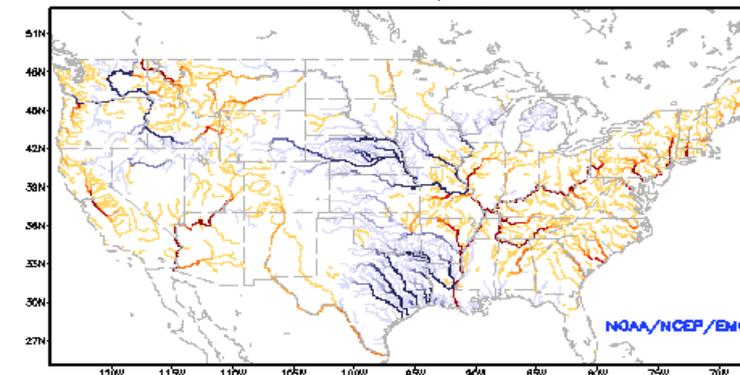


Realtime

NCEP Noah - Past Month Streamflow Anomaly (m³/s)
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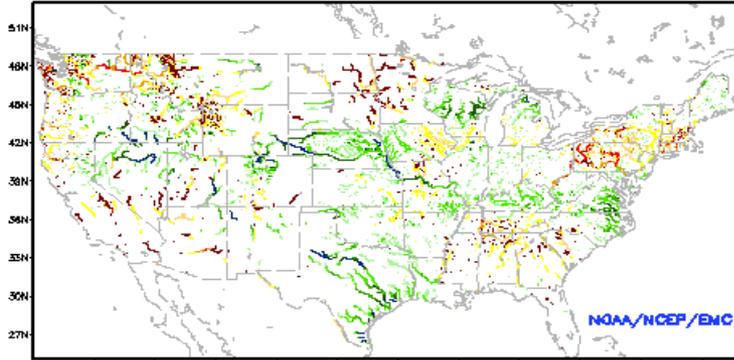


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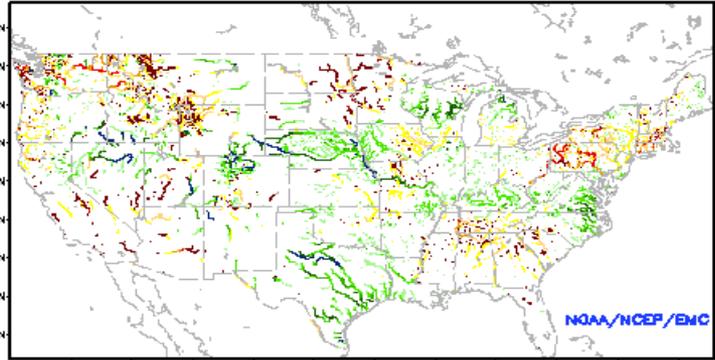


Streamflow Percentile

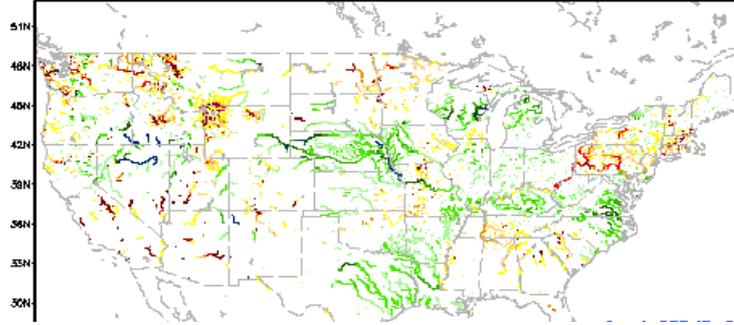
NCEP Noah - Current Streamflow Percentile
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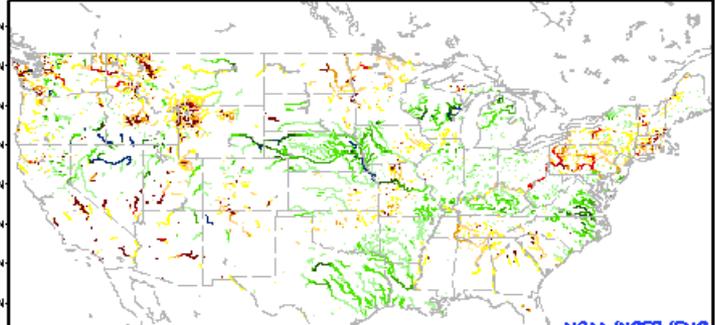
NCEP Noah - Current Streamflow Percentile
Valid: MAY 17, 2016



NCEP Noah - Past Week Streamflow Percentile
Valid: MAY 17, 2016

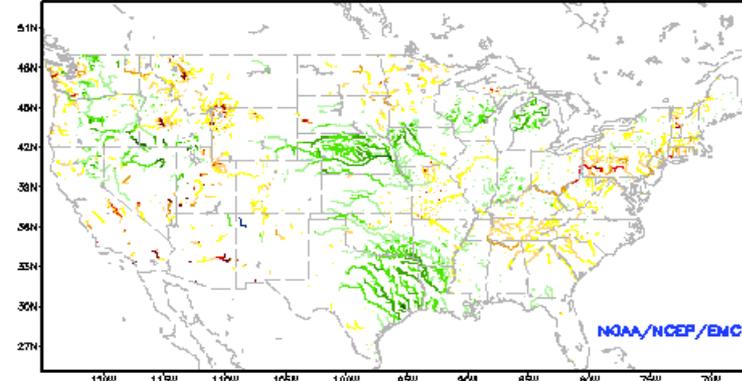


NCEP Noah - Past Week Streamflow Percentile
Valid: MAY 17, 2016

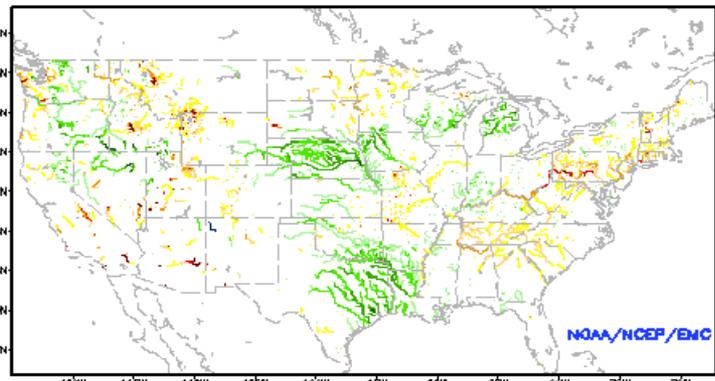


Realtime

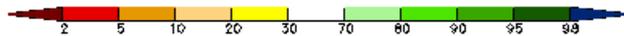
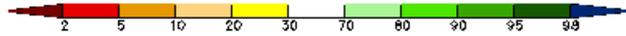
NCEP Noah - Past Month Streamflow Percentile
Valid: MAY 17, 2016



NCEP Noah - Past Month Streamflow Percentile
Valid: MAY 17, 2016

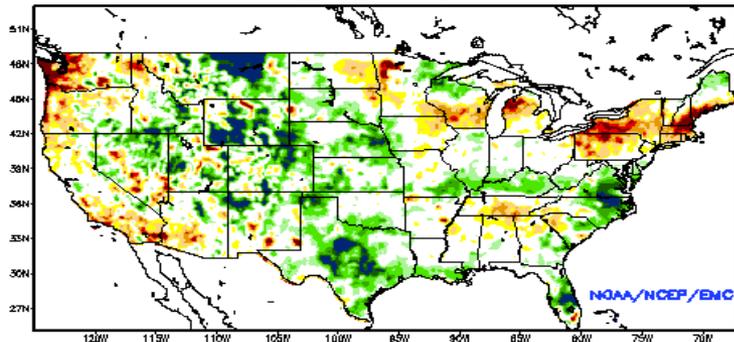


OPS

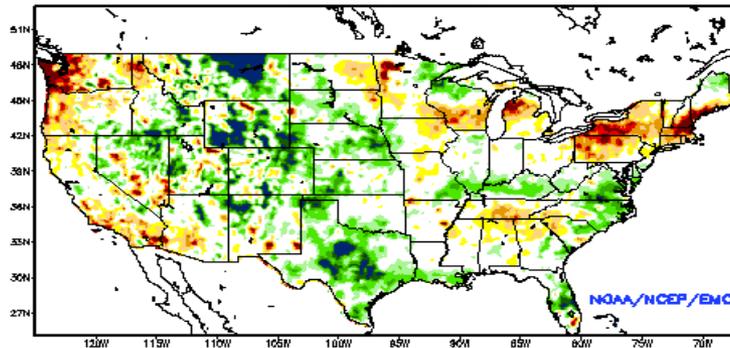


Total column soil moisture percentile

NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 18, 2018

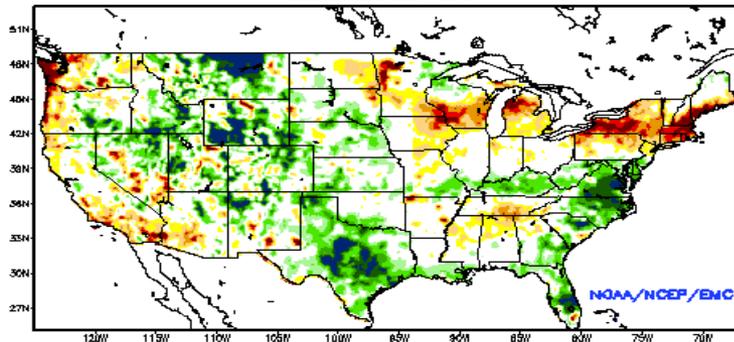


NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 18, 2018

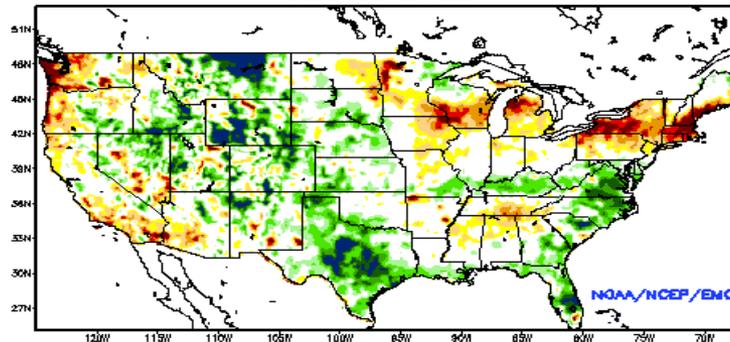


Daily

NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 23, 2018

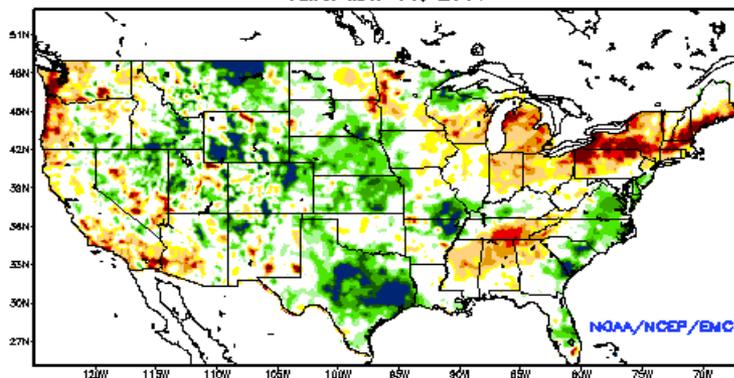


NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 23, 2018

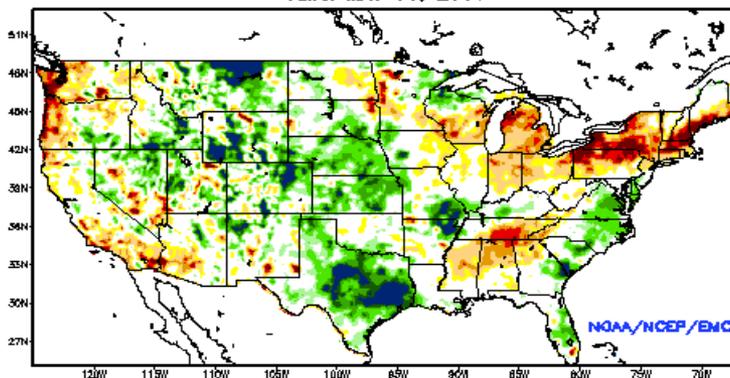


Weekly

NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 31, 2018



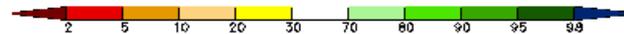
NCEP Noah - Current Total Column Soil Moisture Percentile
Valid: MAY 31, 2018



Monthly



OPS



Realtime

Summary

▲ Comparison shows that there is little difference between OPS and Realtime for both top 1m and total column soil moisture anomaly/percentiles at three time scales (daily, weekly, and monthly) – good news.

▲ ET shows large difference for both anomaly and percentile for OPS and Realtime run. Daily product has larger difference than monthly product.

▲ Q shows moderate differences at daily time scales, and there is little difference for weekly and monthly time scale.

▲ There is little difference for OPS and Realtime run for streamflow anomaly and percentile for all three time scales. - good

▲ A systematic assessment is needed via relative bias, RMSE, and drought area difference analysis. This is ongoing work

*Thanks for your attention
Suggestions/comments
are welcome*